

## Union Calendar No. 122

110TH CONGRESS  
1ST SESSION

# H. R. 2304

[Report No. 110–203]

To direct the Secretary of Energy to conduct a program of research, development, demonstration, and commercial application for geothermal energy, and for other purposes.

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### IN THE HOUSE OF REPRESENTATIVES

MAY 14, 2007

Mr. MCNERNEY (for himself, Mr. GORDON of Tennessee, and Mr. LAMPSON) introduced the following bill; which was referred to the Committee on Science and Technology

JUNE 21, 2007

Additional sponsors: Mr. HONDA, Mr. INSLEE, Mr. HALL of New York, Ms. MATSUI, Ms. WOOLSEY, Mr. MATHESON, Mr. MILLER of North Carolina, Ms. JACKSON-LEE of Texas, Ms. BERKLEY, Mr. MARSHALL, Mr. SCHIFF, and Mr. WALDEN of Oregon

JUNE 21, 2007

Reported with an amendment, committed to the Committee of the Whole House on the State of the Union, and ordered to be printed

[Strike out all after the enacting clause and insert the part printed in *italic*]

[For text of introduced bill, see copy of bill as introduced on May 14, 2007]

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## A BILL

To direct the Secretary of Energy to conduct a program of research, development, demonstration, and commercial

application for geothermal energy, and for other purposes.

1       *Be it enacted by the Senate and House of Representa-*  
2       *tives of the United States of America in Congress assembled,*

3       **SECTION 1. SHORT TITLE.**

4       *This Act may be cited as the “Advanced Geothermal*  
5       *Energy Research and Development Act of 2007”.*

6       **SEC. 2. FINDINGS.**

7       *The Congress finds the following:*

8               *(1) The United States has a critical national in-*  
9               *terest in developing clean, domestic, renewable sources*  
10              *of energy in order to mitigate the causes of climate*  
11              *change, reduce other environmental impacts of energy*  
12              *production, increase national security, improve public*  
13              *health, and bolster economic stability.*

14              *(2) Geothermal energy is a renewable energy re-*  
15              *source.*

16              *(3) Geothermal energy is unusual among renew-*  
17              *able energy sources because of its ability to provide an*  
18              *uninterrupted supply of baseload electricity.*

19              *(4) Recently published assessments by reputable*  
20              *experts, including the Massachusetts Institute of Tech-*  
21              *nology, the Western Governors Association, and the*  
22              *National Renewable Energy Laboratory, indicate that*  
23              *the Nation’s geothermal resources are widely distrib-*  
24              *uted, vast in size, and barely tapped.*

1           (5) *Sustained and expanded research, develop-*  
2           *ment, demonstration, and commercial application*  
3           *programs are needed to locate and characterize geo-*  
4           *thermal resources, and to develop the technologies that*  
5           *will enable their widespread commercial development.*

6           (6) *Federal support is critical to reduce the fi-*  
7           *nancial risk associated with developing new geo-*  
8           *thermal technologies, thereby encouraging the private*  
9           *sector investment necessary to make geothermal re-*  
10          *sources commercially viable as a source of electric*  
11          *power and for other applications.*

12 **SEC. 3. DEFINITIONS.**

13       *For purposes of this Act:*

14           (1) *ENGINEERED.*—*When referring to enhanced*  
15           *geothermal systems, the term “engineered” means sub-*  
16           *jected to intervention, including intervention to ad-*  
17           *dress one or more of the following issues:*

18                   (A) *Lack of effective permeability or poros-*  
19                   *ity or open fracture connectivity within the res-*  
20                   *ervoir.*

21                   (B) *Insufficient contained geofluid in the*  
22                   *reservoir.*

23                   (C) *A low average geothermal gradient,*  
24                   *which necessitates deeper drilling.*

1           (2) *ENHANCED GEOTHERMAL SYSTEMS.*—The  
2       term “enhanced geothermal systems” means geo-  
3       thermal reservoir systems that are engineered, as op-  
4       posed to occurring naturally.

5           (3) *GEOFLUID.*—The term “geofluid” means any  
6       fluid used to extract thermal energy from the Earth  
7       which is transported to the surface for direct use or  
8       electric power generation, except that such term shall  
9       not include oil or natural gas.

10          (4) *GEOPRESSURED RESOURCES.*—The term  
11       “geopressured resources” mean geothermal deposits  
12       found in sedimentary rocks under higher than normal  
13       pressure and saturated with gas or methane.

14          (5) *GEOTHERMAL.*—The term “geothermal” re-  
15       fers to heat energy stored in the Earth’s crust that  
16       can be accessed for direct use or electric power genera-  
17       tion.

18          (6) *HYDROTHERMAL.*—The term “hydrothermal”  
19       refers to naturally occurring subsurface reservoirs of  
20       hot water or steam.

21          (7) *SECRETARY.*—The term “Secretary” means  
22       the Secretary of Energy.

23          (8) *SYSTEMS APPROACH.*—The term “systems  
24       approach” means an approach to solving problems or  
25       designing systems that attempts to optimize the per-

1        *formance of the overall system, rather than a par-*  
2        *ticular component of the system.*

3        **SEC. 4. HYDROTHERMAL RESEARCH AND DEVELOPMENT.**

4        (a) *IN GENERAL.*—*The Secretary shall support pro-*  
5        *grams of research, development, demonstration, and com-*  
6        *mercial application to expand the use of geothermal energy*  
7        *production from hydrothermal systems, including the pro-*  
8        *grams described in subsection (b).*

9        (b) *PROGRAMS.*—

10        (1) *ADVANCED HYDROTHERMAL RESOURCE*  
11        *TOOLS.*—*The Secretary, in consultation with other*  
12        *appropriate agencies, shall support a program to de-*  
13        *velop advanced geophysical, geochemical, and geologic*  
14        *tools to assist in locating hidden hydrothermal re-*  
15        *sources, and to increase the reliability of site charac-*  
16        *terization before, during, and after initial drilling.*  
17        *The program shall develop new prospecting techniques*  
18        *to assist in prioritization of targets for characteriza-*  
19        *tion. The program shall include a field component.*

20        (2) *INDUSTRY COUPLED EXPLORATORY DRILL-*  
21        *ING.*—*The Secretary shall support a program of cost-*  
22        *shared field demonstration programs, to be pursued,*  
23        *simultaneously and independently, in collaboration*  
24        *with industry partners, for the demonstration of tech-*  
25        *nologies and techniques of siting and exploratory*

1        *drilling for undiscovered resources in a variety of geo-*  
 2        *logic settings. The program shall include incentives to*  
 3        *encourage the use of advanced technologies and tech-*  
 4        *niques.*

5    **SEC. 5. GENERAL GEOTHERMAL SYSTEMS RESEARCH AND**  
 6        **DEVELOPMENT.**

7        (a) *SUBSURFACE COMPONENTS AND SYSTEMS.—The*  
 8        *Secretary shall support a program of research, development,*  
 9        *demonstration, and commercial application of components*  
 10       *and systems capable of withstanding extreme geothermal*  
 11       *environments and necessary to cost-effectively develop,*  
 12       *produce, and monitor geothermal reservoirs and produce*  
 13       *geothermal energy. These components and systems shall in-*  
 14       *clude advanced casing systems (expandable tubular casing,*  
 15       *low-clearance casing designs, and others), high-temperature*  
 16       *cements, high-temperature submersible pumps, and high-*  
 17       *temperature packers, as well as technologies for under-ream-*  
 18       *ing, multilateral completions, high-temperature logging,*  
 19       *and logging while drilling.*

20       (b) *RESERVOIR PERFORMANCE MODELING.—The Sec-*  
 21       *retary shall support a program of research, development,*  
 22       *demonstration, and commercial application of models of*  
 23       *geothermal reservoir performance, with an emphasis on ac-*  
 24       *curately modeling performance over time. Models shall be*  
 25       *developed to assist both in the development of geothermal*

1 *reservoirs and to more accurately account for stress-related*  
2 *effects in stimulated hydrothermal and enhanced geothermal*  
3 *systems production environments.*

4 *(c) ENVIRONMENTAL IMPACTS.—The Secretary shall—*

5 *(1) support a program of research, development,*  
6 *demonstration, and commercial application of tech-*  
7 *nologies and practices designed to mitigate or pre-*  
8 *clude potential adverse environmental impacts of geo-*  
9 *thermal energy development, production or use, and*  
10 *seek to ensure that geothermal energy development is*  
11 *consistent with the highest practicable standards of*  
12 *environmental stewardship; and*

13 *(2) in conjunction with the Assistant Adminis-*  
14 *trator for Research and Development at the Environ-*  
15 *mental Protection Agency, support a research pro-*  
16 *gram to identify potential environmental impacts of*  
17 *geothermal energy development, production, and use,*  
18 *and ensure that the program described in paragraph*  
19 *(1) addresses such impacts, including effects on*  
20 *groundwater and local hydrology.*

21 *Any potential environmental impacts identified as part of*  
22 *the development, production, and use of geothermal energy*  
23 *shall be measured and examined against the potential emis-*  
24 *sions offsets of greenhouses gases gained by geothermal en-*  
25 *ergy development, production, and use.*

1 **SEC. 6. ENHANCED GEOTHERMAL SYSTEMS RESEARCH AND**  
 2 **DEVELOPMENT.**

3 (a) *IN GENERAL.*—*The Secretary shall support a pro-*  
 4 *gram of research, development, demonstration, and commer-*  
 5 *cial application for enhanced geothermal systems, including*  
 6 *the programs described in subsection (b).*

7 (b) *PROGRAMS.*—

8 (1) *ENHANCED GEOTHERMAL SYSTEMS TECH-*  
 9 *NOLOGIES.*—*The Secretary shall support a program*  
 10 *of research, development, demonstration, and commer-*  
 11 *cial application of the technologies and knowledge*  
 12 *necessary for enhanced geothermal systems to advance*  
 13 *to a state of commercial readiness, including advances*  
 14 *in—*

15 (A) *reservoir stimulation;*

16 (B) *reservoir characterization, monitoring,*  
 17 *and modeling;*

18 (C) *stress mapping;*

19 (D) *tracer development;*

20 (E) *three-dimensional tomography;*

21 (F) *understanding seismic effects of res-*  
 22 *ervoir engineering and stimulation; and*

23 (G) *laser-based drilling technology.*

24 (2) *ENHANCED GEOTHERMAL SYSTEMS RES-*  
 25 *ERVOIR STIMULATION.*—



1           (A) *PROGRAM.*—*In collaboration with in-*  
2           *dustry partners, the Secretary shall support a*  
3           *program of research, development, and dem-*  
4           *onstration of enhanced geothermal systems res-*  
5           *ervoir stimulation technologies and techniques. A*  
6           *minimum of 5 sites shall be selected in locations*  
7           *that show particular promise for enhanced geo-*  
8           *thermal systems development. Each site shall—*

9                     (i) *represent a different class of sub-*  
10                    *surface geologic environments; and*

11                   (ii) *take advantage of an existing site*  
12                    *where subsurface characterization has been*  
13                    *conducted or existing drill holes can be uti-*  
14                    *lized, if possible.*

15           (B) *CONSIDERATION OF EXISTING SITES.*—  
16           *The following 2 sites, where Department of En-*  
17           *ergy and industry cooperative enhanced geo-*  
18           *thermal systems projects are already underway,*  
19           *may be considered for inclusion among the sites*  
20           *selected under subparagraph (A):*

21                   (i) *Desert Peak, Nevada.*

22                   (ii) *Coso, California.*

1 **SEC. 7. GEOTHERMAL ENERGY PRODUCTION FROM OIL AND**  
2 **GAS FIELDS AND RECOVERY AND PRODUC-**  
3 **TION OF GEOPRESSURED GAS RESOURCES.**

4 (a) *IN GENERAL.*—The Secretary shall establish a pro-  
5 gram of research, development, demonstration, and commer-  
6 cial application to support development of geothermal en-  
7 ergy production from oil and gas fields and production and  
8 recovery of energy from geopressured resources. In addition,  
9 the Secretary shall conduct such supporting activities in-  
10 cluding research, resource characterization, and technology  
11 development as necessary.

12 (b) *GEOTHERMAL ENERGY PRODUCTION FROM OIL*  
13 *AND GAS FIELDS.*—The Secretary shall implement a grant  
14 program in support of geothermal energy production from  
15 oil and gas fields. The program shall include grants for a  
16 total of not less than three demonstration projects of the  
17 use of geothermal techniques such as organic rankine cycle  
18 systems at marginal, unproductive, and productive oil and  
19 gas wells. The Secretary shall, to the extent practicable and  
20 in the public interest, make awards that—

21 (1) *include not less than five oil or gas well sites*  
22 *per project award;*

23 (2) *use a range of oil or gas well hot water*  
24 *source temperatures from 150 degrees Fahrenheit to*  
25 *300 degrees Fahrenheit;*

26 (3) *cover a range of sizes up to one megawatt;*

1           (4) are located at a range of sites;

2           (5) can be replicated at a wide range of sites;

3           (6) facilitate identification of optimum tech-  
4           niques among competing alternatives;

5           (7) include business commercialization plans  
6           that have the potential for production of equipment at  
7           high volumes and operation and support at a large  
8           number of sites; and

9           (8) satisfy other criteria that the Secretary deter-  
10          mines are necessary to carry out the program and  
11          collect necessary data and information.

12       *The Secretary shall give preference to assessments that ad-  
13       dress multiple elements contained in paragraphs (1)  
14       through (8).*

15       (c) *GRANT AWARDS.*—Each grant award for dem-  
16       onstration of geothermal technology such as organic rankine  
17       cycle systems at oil and gas wells made by the Secretary  
18       under subsection (b) shall include—

19           (1) necessary and appropriate site engineering  
20           study;

21           (2) detailed economic assessment of site specific  
22           conditions;

23           (3) appropriate feasibility studies to determine  
24           whether the demonstration can be replicated;

1           (4) *design or adaptation of existing technology*  
2           *for site specific circumstances or conditions;*

3           (5) *installation of equipment, service, and sup-*  
4           *port;*

5           (6) *operation for a minimum of one year and*  
6           *monitoring for the duration of the demonstration; and*

7           (7) *validation of technical and economic assump-*  
8           *tions and documentation of lessons learned.*

9           (d) *GEOPRESSURED GAS RESOURCE RECOVERY AND*  
10          *PRODUCTION.—(1) The Secretary shall implement a pro-*  
11          *gram to support the research, development, demonstration,*  
12          *and commercial application of cost-effective techniques to*  
13          *produce energy from geopressured resources situated in and*  
14          *near the Gulf of Mexico.*

15          (2) *The Secretary shall solicit preliminary engineering*  
16          *designs for geopressured resources production and recovery*  
17          *facilities.*

18          (3) *Based upon a review of the preliminary designs,*  
19          *the Secretary shall award grants, which may be cost-shared,*  
20          *to support the detailed development and completion of engi-*  
21          *neering, architectural and technical plans needed to support*  
22          *construction of new designs.*

23          (4) *Based upon a review of the final design plans*  
24          *above, the Secretary shall award cost-shared development*  
25          *and construction grants for demonstration geopressured*

1 *production facilities that show potential for economic recov-*  
 2 *ery of the heat, kinetic energy and gas resources from*  
 3 *geopressured resources.*

4 *(e) COMPETITIVE GRANT SELECTION.—Not less than*  
 5 *90 days after the date of the enactment of this Act, the Sec-*  
 6 *retary shall conduct a national solicitation for applications*  
 7 *for grants under the programs outlined in subsections (b)*  
 8 *and (d). Grant recipients shall be selected on a competitive*  
 9 *basis based on criteria in the respective subsection.*

10 *(f) WELL DRILLING.—No funds may be used under*  
 11 *this section for the purpose of drilling new wells.*

12 **SEC. 8. COST SHARING AND PROPOSAL EVALUATION.**

13 *(a) FEDERAL SHARE.—(1) The Federal share of costs*  
 14 *of projects funded under this Act shall be in accordance with*  
 15 *section 988 of the Energy Policy Act of 2005.*

16 *(2) The Secretary may waive the Federal cost share*  
 17 *requirement for grants awarded to universities, national*  
 18 *laboratories, or similar noncommercial entities awarded*  
 19 *grants under this Act.*

20 *(3) The Secretary shall allow for a competitive bidding*  
 21 *process to play a role in determining the final cost-share*  
 22 *ratio.*

23 *(b) ORGANIZATION AND ADMINISTRATION OF PRO-*  
 24 *GRAMS.—Programs under this Act shall incorporate the fol-*  
 25 *lowing organizational and administrative elements:*

1           (1) *Non-Federal participants shall be chosen*  
2           *through a competitive selection process.*

3           (2) *The request for proposals for each program*  
4           *shall stipulate, at a minimum, the following:*

5                   (A) *The non-Federal funding requirements*  
6                   *for projects.*

7                   (B) *The funding mechanism to be used (i.e.*  
8                   *grants, contracts, or cooperative agreements).*

9                   (C) *Milestones and a schedule for comple-*  
10                  *tion.*

11                  (D) *Criteria for evaluating proposals.*

12           (3) *In evaluating proposals, the Secretary shall*  
13           *give priority to proposals that draw on relevant ex-*  
14           *pertise from industry, academia, and the national*  
15           *laboratories, as appropriate.*

16           (4) *The Secretary shall coordinate with, and*  
17           *where appropriate may provide funds in furtherance*  
18           *of the purposes of this Act to, other Department of*  
19           *Energy research and development programs focused*  
20           *on drilling, subsurface characterization, and other re-*  
21           *lated technologies.*

22           (5) *In evaluating proposals, the Secretary shall*  
23           *consult with relevant experts from industry, aca-*  
24           *demia, and the national laboratories, as appropriate.*

1           (6) *In evaluating proposals, the Secretary shall*  
 2           *give priority to proposals that demonstrate clear evi-*  
 3           *dence of employing a systems approach.*

4           (7) *In evaluating proposals for projects with a*  
 5           *field component, the Secretary shall, where appro-*  
 6           *priate, give priority consideration to proposals that*  
 7           *contain provisions to study local environmental im-*  
 8           *pacts of the technologies developed or the operations*  
 9           *undertaken.*

10          (8) *Data collected by the Secretary as a result of*  
 11          *any project supported with funds provided under this*  
 12          *Act shall be made available to the public, except to the*  
 13          *extent that they contain information that is protected*  
 14          *from disclosure under section 552(b) of title 5, United*  
 15          *States Code.*

16 **SEC. 9. CENTERS FOR GEOTHERMAL TECHNOLOGY TRANS-**  
 17 **FER.**

18          (a) *IN GENERAL.*—*The Secretary shall award grants*  
 19          *to institutions of higher education (or consortia thereof) to*  
 20          *establish 2 Centers for Geothermal Technology Transfer.*

21          (b) *CENTERS.*—

22               (1) *HYDROTHERMAL CENTER.*—*The purpose of*  
 23               *one Technology Transfer Center shall be to serve as an*  
 24               *information clearinghouse for the geothermal indus-*  
 25               *try, collecting and disseminating information on best*

1 *practices in all areas related to developing and man-*  
 2 *aging hydrothermal resources, including data avail-*  
 3 *able for disclosure as provided under section 8(b)(8).*  
 4 *This Center shall be based at the institution west of*  
 5 *the Mississippi River that the Secretary considers to*  
 6 *be best suited to the purpose. The Center shall collect*  
 7 *and disseminate information on all subjects germane*  
 8 *to the development and user of hydrothermal systems,*  
 9 *including—*

10 *(A) resource location;*

11 *(B) reservoir characterization, monitoring,*  
 12 *and modeling;*

13 *(C) drilling techniques;*

14 *(D) reservoir management techniques; and*

15 *(E) technologies for electric power conver-*  
 16 *sion or direct use of geothermal energy.*

17 *(2) ENHANCED GEOTHERMAL SYSTEMS CEN-*  
 18 *TER.—The purpose of a second Technology Transfer*  
 19 *Center shall be to serve as an information clearing-*  
 20 *house for the geothermal industry, collecting and dis-*  
 21 *seminating information on best practices in all areas*  
 22 *related to developing and managing enhanced geo-*  
 23 *thermal systems resources, including data available*  
 24 *for disclosure as provided under section 8(b)(8). This*  
 25 *Center is encouraged to seek opportunities to coordi-*



1        *nate efforts and share information with international*  
 2        *partners engaged in research and development of en-*  
 3        *hanced geothermal systems or engaged in collection of*  
 4        *data related to enhanced geothermal systems develop-*  
 5        *ment. This Center shall be based at an academic in-*  
 6        *stitution east of the Rocky Mountains which, in the*  
 7        *opinion of the Secretary, is best suited to provide na-*  
 8        *tional leadership on enhanced geothermal systems-re-*  
 9        *lated issues. The Center shall collect and disseminate*  
 10       *information on all subjects germane to the develop-*  
 11       *ment and use of enhanced geothermal systems.*

12       *(c) AWARD DURATION.—An award made by the Sec-*  
 13       *retary under this section shall be for an initial period of*  
 14       *5 years, and may be renewed for additional 5-year periods*  
 15       *on the basis of—*

16                *(1) satisfactory performance in meeting the goals*  
 17                *of the research plan proposed by the Center; and*

18                *(2) other requirements as specified by the Sec-*  
 19                *retary.*

## 20       **SEC. 10. GEOPOWERING AMERICA.**

21        *The Secretary shall expand the Department of Ener-*  
 22        *gy's GeoPowering the West program to extend its geo-*  
 23        *thermal technology transfer activities throughout the entire*  
 24        *United States. The program shall be renamed*  
 25        *“GeoPowering America”. The program shall continue to be*

1 *based in the Department of Energy office in Golden, Colo-*  
 2 *rado.*

3 **SEC. 11. REPORTS.**

4       (a) *REPORTS ON ADVANCED USES OF GEOTHERMAL*  
 5 *ENERGY.*—*Not later than 1 year, 3 years, and 5 years, after*  
 6 *the date of enactment of this Act, the Secretary shall report*  
 7 *to the Committee on Science and Technology of the House*  
 8 *of Representatives and the Committee on Energy and Nat-*  
 9 *ural Resources of the Senate on advanced concepts and tech-*  
 10 *nologies to maximize the geothermal resource potential of*  
 11 *the United States. The reports shall include—*

12               (1) *the use of carbon dioxide as an alternative*  
 13 *geofluid with potential carbon sequestration benefits;*

14               (2) *mineral recovery from geofluids;*

15               (3) *use of geothermal energy to produce hydro-*  
 16 *gen;*

17               (4) *use of geothermal energy to produce biofuels;*

18               (5) *use of geothermal heat for oil recovery from*  
 19 *oil shales and tar sands; and*

20               (6) *other advanced geothermal technologies, in-*  
 21 *cluding advanced drilling technologies and advanced*  
 22 *power conversion technologies.*

23       (b) *PROGRESS REPORTS.*—(1) *Not later than 36*  
 24 *months after the date of enactment of this Act, the Secretary*  
 25 *shall submit to the Committee on Science and Technology*

1 *of the House of Representatives and the Committee on En-*  
2 *ergy and Natural Resources of the Senate an interim report*  
3 *describing the progress made under this Act. At the end of*  
4 *60 months, the Secretary shall submit to Congress a report*  
5 *on the results of projects undertaken under this Act and*  
6 *other such information the Secretary considers appropriate.*

7       *(2) As necessary, the Secretary shall report to the Con-*  
8 *gress on any legal, regulatory, or other barriers encountered*  
9 *that hinder economic development of these resources, and*  
10 *provide recommendations on legislative or other actions*  
11 *needed to address such impediments.*

12 **SEC. 12. APPLICABILITY OF OTHER LAWS.**

13       *Nothing in this Act shall be construed as waiving the*  
14 *applicability of any requirement under any environmental*  
15 *or other Federal or State law.*

16 **SEC. 13. AUTHORIZATION OF APPROPRIATIONS.**

17       *There are authorized to be appropriated to the Sec-*  
18 *retary to carry out this Act \$90,000,000 for each of the fis-*  
19 *cal years 2008 through 2012, of which \$10,000,000 for each*  
20 *fiscal year shall be for carrying out section 7.*

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